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ABSTRACT

This paper describes the progress of applying the integrated curriculum in two elementary classrooms. Utilizing science as the core course of integrated curriculum, three elementary teachers and two university-based educators worked together to design and to conduct the experimental course of integrated-curriculum. Based on the approach of collaborative action research, the team members had weekly meetings to discuss the strategies of integrated-curriculum plans, designed the integrated-curriculum, applied the curriculum, found the problems (including teaching and learning problems) and solved problems, and developed the suitable integrated-curriculum model with a theoretical and practical rationale. Results of the study show that the activity-based integrated-curriculum is a proper model for teachers in connecting the different subjects to deal with aspects of one topic at the same time, and is a proper approach for students in connecting their learning in the school with their real life experiences. Under the integrated-curriculum approach, students spend more time doing science homework and need to use the science skills in other courses; it is a way to improve the student's interest in science. However, to design and develop the integrated-curriculum in the school is highly reliant on collaboration by teachers, administrators, and/or parents. Therefore, a research team or curriculum development team is necessary for the school while attempting to conduct the integrated-curriculum project. Finally, meaningful change in the curriculum is a long-term project, which may take two or more years in order to become institutionalized. (Author/ASK)

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# Utilizing the Science as Core Course of an Integrated Curriculum Development: A Collaborative Action Research

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## ABSTRACT

The current paper intends to describe the progress of applying the integrated-curriculum in two elementary classrooms. Utilizing the science as the core course of integrated curriculum, three elementary teachers and two university-based educators work together to design and to conduct the experimental course of integrated-curriculum. Based on the approach of collaborative action research, the team members have weekly meeting to discuss the strategies of integrated-curriculum plans, design the integrated-curriculum, apply the curriculum, find the problems (included teaching and learning problems) and solve problems, and develop the suitable integrated-curriculum model that with theoretical and practical rational. Results of the study shows that the activity-based integrated-curriculum is a proper model for teachers in connecting the different subjects to deal with aspects of one topic at the same time, and is a proper approach for students in connecting their learning in the school with their real life experiences. Under the integrated-curriculum approach, students spend more times in doing science homework as well as need to use the science skills in other courses; it is a way to improve the student's interest in sciecne. However, to design and develop the integrated-curriculum in the school is highly relied on the collaboration by teachers, administrators and/or parents. Therefore, to group a research team or curriculum develop team is necessary for the school while attempt to conduct the integrated-curriculum project. Finally, meaningful change of the curriculum is a long-term project, based on our experiences, it may take two or more years in order to become institutionalized.

Keyword: Integrated-curriculum, activity-based integrated curriculum, action research, science education, elementary education.

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## Background

Attempts to provide pupils a better circumstances in learning science, science educators have focused on the issues of science curriculum, instructional approaches, kid science concepts and so on for a long time. In the early summer of 1997, one of my research coworkers, Mr. Wang, an elementary teacher, questioned me about should we only need to concern the issues of science education in the science classroom? Moreover, should we also need to concern the connections between science and other courses. According to his teaching experience, he finds some science units he teaches may have been taught in other courses, such as mathematics, Chinese, social science and so on. He listed three questions. (A) Students may already learn science concepts in other courses but incorrect. (B) The different courses may cover same contents; students spend time in learning same thing. And (C) Students do not realize that the contents they have learned in other courses can be applied in science and vise versa. To increase students learning interest and learning efficiency in science, he suggested to use the science as core course and to integrate other courses into the curriculum.

Utilizing the approach of collaborative action research, purposes of the study are: (a) to develop an appropriate curriculum for students in learning science, and (b)to develop a ideal model as reference for science teachers to design a curriculum.

## Literature Review

*Integrated curriculum*

The integrated curriculum can be defined as the integration of several subjects or areas of study into a framework. The aim of integrated curriculum attempts to provide both understanding of one course (e.g., science) and its inter-relatedness with other disciplines and with life outside school (Barak & Pearlman-Avnion, 1999; Raizen, 1997). Integrated curriculum is not a new idea, Fogarty (1991) has reviewed ten ways to integrate curriculum and described the advantages and disadvantages of these approaches. Brophy and Alleman (1991) reminded educators that 'curriculum integration is not always a good idea.' They indicated that some integration activities even distort the original contents should be taught and put students in a confused learning environments. However, the integrated curriculum is a new idea and educational stream in Taiwan, the current research attempts, based on the approach of collaborative action research, to develop an appropriate model of integrated curriculum for the elementary school in Taiwan.

*Collaborative action research*

Action research provides teachers with the span to gain knowledge and skill in

research methods and to become more aware of possibilities for change their professional performance (Oja & Smulyan, 1993). McKernan (1996, p.35) indicated that two essential condition are required while inviting the teachers to conduct research. One is that practitioners should understand and possess research skills, and the other is that the findings should inform teachers in such a manner as to compel them to take action. Teacher as researcher has been treated as an essential part of behaving in the professional way.

In general, the elementary teachers are well know the practical situations and are able to solve the practical problems automatically. However, their problem solving have been criticized that less theoretical. How to induct the results from theoretical research into the practical situation has been discussed for a long time. The collaborative action research, however, is one of the way to meet the theory and practical in once. The collaborative action research is viewed as school-based teachers and university-based educators/researchers work together to make a communication between theory and practice. Moreover, they will communicate frequently and monitor the process to avoid possible conflicting perceptions between theory and practice which results from their different roles in the field (Oja & Smulyan, 1993).

In Taiwan, more and more elementary schools require their teachers doing action research and presenting their results in publications. That is, the skills and abilities of doing action research tends to be the partial requirements of an progessional elementary teachers. The current study, under the idea of collaborative action research, group the elementary teachers and university-based educators, to design and develop the integrated curriculum and apply and evaluate the development integrated-curriculum.

## Methods

Utilizing the approach of collaborative action research, three elementary teachers, two university-based educators/researchers, and three preservice teachers work together in developing the integrated curriculum models.

The study is conducted at an urban elementary school in Taitung county. The school has 29 classes from grade 1 to grade 6; grade 5 has four classes. We selected two of the four classes from grade 5 as our experimental group. Two classroom teachers and one science subject teacher are the "main actors" of the study. They are in charge of developing the curriculum and implementing the curriculum into their classroom teaching activities. Three preservice teachers assist the team in developing the curriculum, observing the teaching activities, documenting the

research team meeting, and analyzing data. Two university-based educators /researchers are in charge of evaluating and advising the project.

Under the idea of collaborating-teach, three elementary teachers, Mr. Wang, Mrs. Chen, and Mr. Chao, are in charge of teaching the mathematics, Chinese, and science respectively. Each teacher teach one course at two different classes, that is Class C (Mr. Wang is the classroom teacher) and Class D (Mrs. Chen is the classroom teacher). Since it is an action research, therefore, the processes of developing, implementing, evaluating, and reforming are continuous used in the study, it is a circle and will not be ended until an appropriate model has been confirmed. The study begins at fall 1998. The present manuscript attempts to describe and discuss the findings of the project of the first year, and sharing our experience with other science educators.

## Results and Findings

*Implementing a New Curriculum: Face Students Parents*

The study began at July 1998. In order to prepare a smooth condition for implementing the integrated curriculum, research team has held several meetings with school administration and parents before the study began as well as during the study. Because the idea of integrated curriculum is a new term to parents, many parents questioned about the meaning of integrated curriculum to their kids. They asked teachers used the textbooks when they found the classroom materials that their kids used were different from textbook contents. Parents complained that they were not able to help their kids in preparing the homework and tests because teachers used many resources in the classroom that were not same as they used. They pointed out that the textbooks and self-help books (the book that covers the contents of textbook and test items) were the most important resources for them to monitor what their kids have learned in the school. Since the teachers did not follow the sequence textbooks, they felt uncomfortable and worried their kids cannot compete with other in the future.

Although the team faced many arguments during the experimental study was settled, the teachers believed that the integrated-curriculum should be good for the kids once they have learned the skills (e.g., searching, converging, diverging, discussing, writing and presenting) from the classroom and they will be more competent in the future. A strongly encouragement for us continuous our study was the Ministry of Education announced a new curriculum plan in October 1998; and the idea of integrated curriculum is included in the one-to-nine grade curriculum. It is a convincible reason to persuade parents that the integrated curriculum is the current educational stream. It also shows us that our study has its value to evidence the meaningful of integrated-curriculum to students, teachers and parents.

The research team has started to organize the new curriculum in July 1998. We reviewed the textbooks of Grade 5 and Grade 6 and intended to identify the units and contents among Chinese, mathematics, science, social science, health and so on have the same or similar concepts. We set the units of science course first then searching the units or concepts of other courses in which were related to the selected scientific topic then put them together. The way we did has been classified as the webbed model (Fogarty, 1991).

For example, the science teacher reorganized the units of textbooks and combined the units of (a) weather changes in Taiwan, (b) sun and four seasons, and (c) earth motion into deal with aspects of one topic - 'Taiwan's weather.' Then the other course teachers listed the related contents can be taught in this topic at the same time. (See Figure 1, the integrated-curriculum graph of Taiwan's weather.)

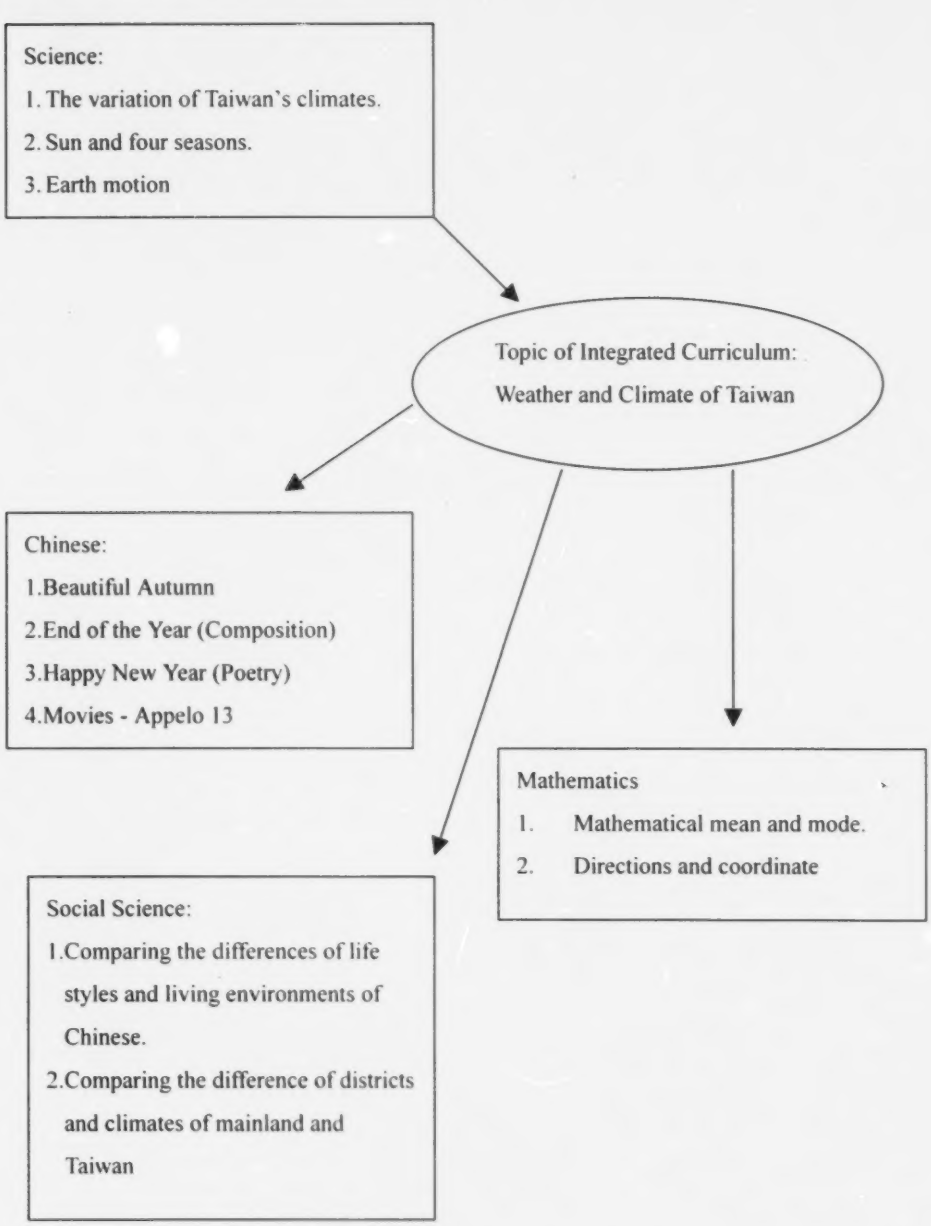
Science:
1. The variation of Taiwan's climates.
2. Sun and four seasons.
3. Earth motion
Topic of Integrated Curriculum:
Weather and Climate of Taiwan
Chinese:
1.Beautiful Autumn
2.End of the Year (Composition)
3.Happy New Year (Poetry)
4.Movies - Appelo 13
Mathematics
1. Mathematical mean and mode.
2. Directions and coordinate
Social Science:
1.Comparing the differences of life styles and living environments of Chinese.
2.Comparing the difference of districts and climates of mainland and Taiwan

Figure 1. The integrated-curriculum blueprint of weather and climate of Taiwan

While applying the Integrated Curriculum 101 from September to November 1998, we faced three problems. First, the contents of each subject may relate to the topic of the integrated curriculum, but the connection or relationship between or among the subjects may not significant. The team spent a lot of time to design an integrated-curriculum that connecting many subjects in one unit. However, we did

not think in depth that is there any connection between two subjects, such as the connection of Chinese and science course, or the connection of science and mathematics. We have discussed the issue and concluded that one should not for integrated curriculum to integrate the subjects. We remind ourselves that we need to concern the relationship among the subjects when we conduct an integrated curriculum next time.

Second, the teacher has to cooperate the contents of curriculum with other teachers, sometimes, one may not able to spend much time in the topic he/she wants to share with students. Under the situation of rigid constraints on time and curriculum contents, the teacher does not have enough time to complete the materials he prepares for students. We have discussed the issue and concluded that to conduct an integrated curriculum in the classroom, we have to implement a flexible timetable into the curriculum. We agreed that sometimes one course may need more hours in a week in order to complete a project so the other course may 'lending' the hours to the course, but vice versa in next week.

Third, the integrated curriculum did not help students to connect the concepts of different courses, they did not know 'how to learn' under such situation. The idea of integrated curriculum is to provide a learning situation that the students can connect the concepts of different subjects and are able to apply the school things into their real life. However, our first shot did not hit the point and most students seem not very happy for such change. We have discussed the issue and concluded that the teachers may know why the curriculum need be changed but the students did not know. And students were not ready for the change. Therefore, the team decided to spend more time to introduce the idea of integrated curriculum to students and attempt to develop a situation that the students are ready for the change.

*Integrated Curriculum 102 : Activity-Based Curriculum*

The research team decided to develop another integrated curriculum model on late of November. Three elementary teachers agreed to use the approach of activity based curriculum to design the integrated curriculum. Activity-based curriculum is similar to the ideal of 'Planning Wheel Approach' (Palmer, 1991); planner can select one topic as the wheel (e.g., moon and stars) then connect the contents or concepts of different curriculums together. The activity-based curriculum emphasizes on the approach of student-center learning. The research team selects the topic of activity and lists several questions, students are asked to response the list questions by doing a project. The selected topic usually is very broad, for instance, the team may ask students to make a plan for the outdoors field trip. The students, therefore, have to

use their literary skills to write a field trip plan. And the plan is required to describe the travel cost (mathematical skills), the introduction of local ecology (science) and the introduction of local society (social science). The purpose of the activity-based curriculum is to help students to realize that the contents they learn in school are highly related to each other and can be transplanted into different situations. The curriculum intends to lead students to apply their learning into real life experience and to help students in learning science, mathematics, literature, and social science from life experiences.

For instance, the team had set 'the Trip in Ken-Din National Park' as the topic of Integrated Curriculum 102. Figure 2 shows the planning wheel of the active-based curriculum. The reason we selected the Ken-Din National Park as our unit-topic was based on the contents of science courses need be taught in grade 5 and 6 - the ecology. It is not easy to explain the terms of ecology in the classroom, the best way is bring the students to a field trip. Therefore, the team discussed the possibility of connecting the contents of textbooks and filed trip in the active-based integrated curriculum. Once we set the focus subject as science course then we began to make the connections among the other subjects. Although we remind ourselves that the important of relation between each subjects, sometimes the subjects may highly relate to the topic and less relate to other courses.

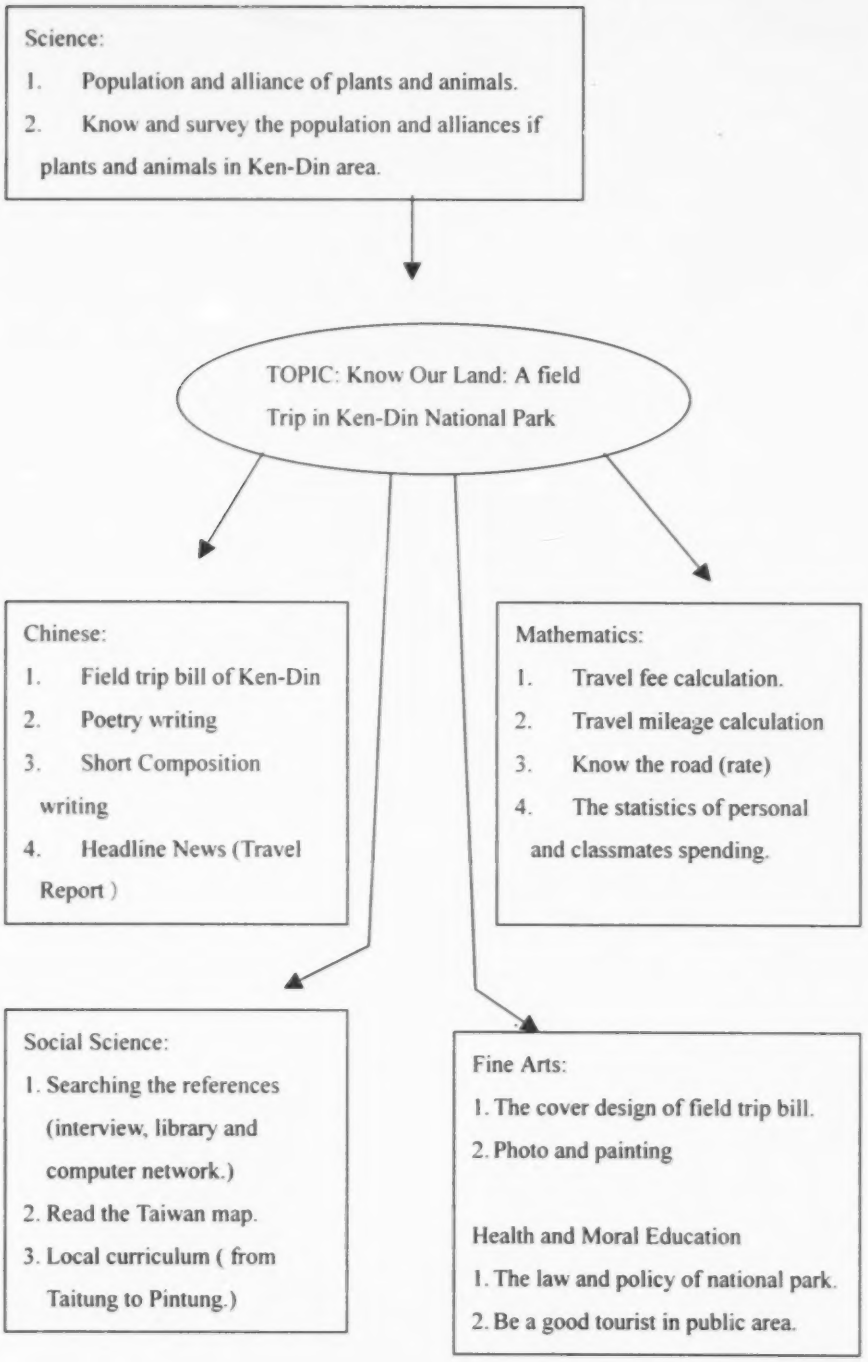
Science:
1. Population and alliance of plants and animals.
2. Know and survey the population and alliances if plants and animals in Ken-Din area.
TOPIC: Know Our Land: A field Trip in Ken-Din National Park
Chinese:
1. Field trip bill of Ken-Din
2. Poetry writing
3. Short Composition writing
4. Headline News (Travel Report )
Mathematics:
1. Travel fee calculation.
2. Travel mileage calculation
3. Know the road (rate)
4. The statistics of personal and classmates spending.
Social Science:
1. Searching the references (interview, library and computer network.)
2. Read the Taiwan map.
3. Local curriculum ( from Taitung to Pintung.)
Fine Arts:
1. The cover design of field trip bill.
2. Photo and painting
Health and Moral Education
1. The law and policy of national park.
2. Be a good tourist in public area.

Figure 2. The integrated-curriculum blueprint of the Ken-Din National Park.



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While applying the Integrated Curriculum 102 into the classroom, most students felt very happy in designing their field-trip plan (individual project). After they completed their projects, teachers asked students to vote the best project of the class. Then teachers printed the best project for each student as their field trip journal and implemented the plan to a real field trip. After completed the field trip, teachers asked students to evaluate the project and to complete the journal; evaluation paper and journal were used to grade students' performance.

The Curriculum 102 is very flexible for teachers to prepare curriculum, and it provides broad space for students in learning new knowledge. However, it also has couple drawbacks, for instance, some learning slowly students cannot participate the team-work and cannot make learning plan. Teachers need to provide other curriculum for those learning slowly students in learning new knowledge. For those students who do not have good social relationship with others, they hardly fit the curriculum because they cannot find classmates work together or communicate with others; they did not learn much from the curriculum.

## Conclusions and Suggestions

The Ministry of Education has announced the new curriculum plan for one-to-nine grade in1998, and will be implemented in 2001. Two characters of the new curriculum are school-based curriculum and integrated curriculum. The current study provides some meaningful information for the government; two issues are discussed as follows.

First, to integrate different courses into one curriculum is an attractive approach, but it may not work as well as we wish. When one 'force' other courses into one unit, one has to ask himself does these courses do really connect to each other? If the answer is no, then one should not apply the integrated curriculum. Because it will not help students learning better, instead it may confuse students in learning the materials that one prepares for them.

Second, many contents of the textbooks we use in the elementary school may not relate to the students' life experience, to conquer the drawback the activity-based curriculum is a useful approach. This approach is under the natural circumstances for students to learn, to discover and to understand knowledge. Therefore, students can learn and develop their concepts and knowledge of different courses while 'deducting' the topic.

Third, the integrated curriculum is one character of the year 2001 one-to-nine curriculum. Many elementary schools have conducted the experimental study of integrated curriculum in Taiwan during the 1999 and 2000 academic-year. However, according to our observations, many elementary teachers still do not understand the

meaning of one-to-nine curriculum and think the new curriculum is equal to the integrated curriculum. They question how to design the integrated curriculum and how to implement the integrated curriculum in the classroom. Based on our study, we suggest the school administrators need to plan the school-based curriculum and to organize the research team or curriculum committee in order to design the integrated curriculum for the school. We suggest the school to provide the environment for teachers acting as researcher or curriculum designers. Under the idea of teacher as researcher as well as the approach of collaborative action research, our experience show that the responsibility of curriculum change can be relied on teachers. In fact, teachers will play important role in developing the curriculum once the one-to-nine curriculum is undertaking.

Forth, science course is one of the subjects that students most dislike it. To provide an interested learning environment let students feel learning science is happy and useful is the aim of science education. The present study used the science as core course of the integrated curriculum, results of the study, based on teachers' observation and students' final projects, shows that students did connect the skills and knowledge they learned in other subjects to the science project and performed a good presentation in the classroom. Because students need to integrate the contents of related subjects into their final project, they realize that the connection among the subjects and find that the things they have learned can be applied in the real life (i.e., the field trip). Therefore, the integrated curriculum is an approach for science educator to develop a curriculum that more close to student's life experience and to increase the learning efficiency in science classroom.

Finally, the best model of integrated curriculum, at this moment, our conclusion is the activity-based integrated curriculum. Two reasons are described as follows. First, the traditional curriculum has classified the school courses too trivial, and the connection among the different courses has been dismissed. It is hard for teachers to develop an integrated curriculum based on the current textbooks. Second, students are used to learn different courses individually from textbooks, they do not know the contents they learned in science can be applied in other courses, vice versa. And the activity-based curriculum can conquer these two problems.

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